(12) UK Patent Application (19) GB (11) 2 388 900 (13) A

(43) Date of A Publication 26.11.2003

(21) Application No: 0309968.6

(22) Date of Filing: 01.05.2003

(30) Priority Data:
(31) 0210191 (32) 03.05.2002 (33) GB

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(51) INT CL[7]:
G01C 9/00 , B25F 5/02 , B25H 1/00 , G01C 9/24
9/26

(52) UK CL (Edition V):
G1F F1A F3 F9
B3C C1B1

(56) Documents Cited:
GB 2374930 A
GB 2358926 A
GB 1511490 A
JP 2000021641 A
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US 20010104987 A

(58) Field of Search:
UK CL (Edition V) B3C, G1F
INT CL[7] B25F, B25H, G01C
Other: On-line:EPODOC,WPI,JAPIO

(54) Abstract Title: Multifunction direction indication device

(57) A direction indicating device/apparatus including a first means, a laser, 13 for indication of orientation of the device relative to a first direction, a second means, spirit level 20, for indication of orientation of the device relative to a direction transverse to the first direction, and a third means, circular spirit level 23 for providing indication of the orientation of the device relative to any desired angle relative to the first and second directions said first second and third directions being orthogonal to each other. A particular application for the device is with a mounting assembly 28 for operationally mounting the device/apparatus to a hand holdable tool, drill (29) requiring to be operationally maintained with its associated tool aligned with one or more of said directions. The longitudinal axis of the spirit level 20 is coaxial with the emitted laser beam (17).

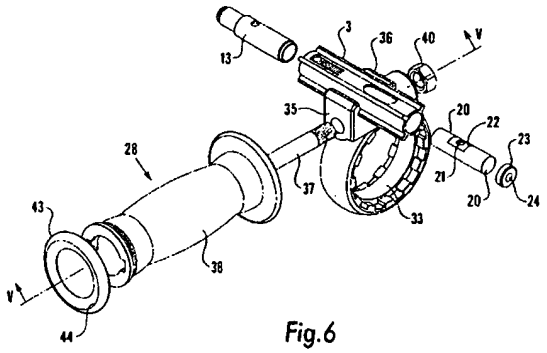

Fig.6

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

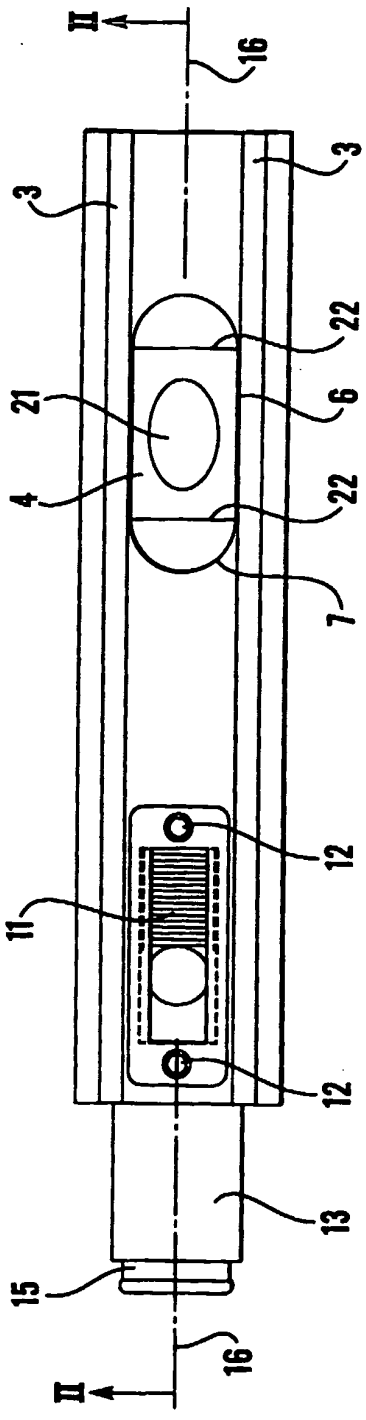
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Fig.1

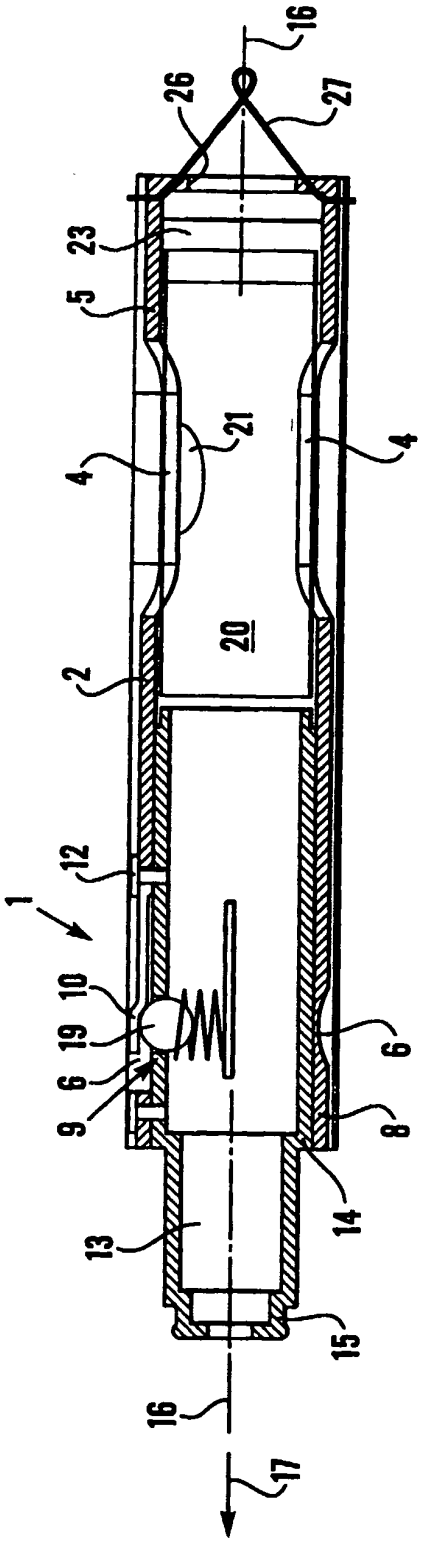
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Fig.2

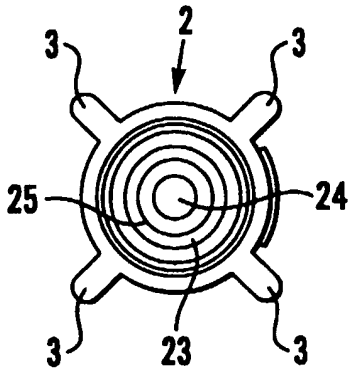

Fig.3

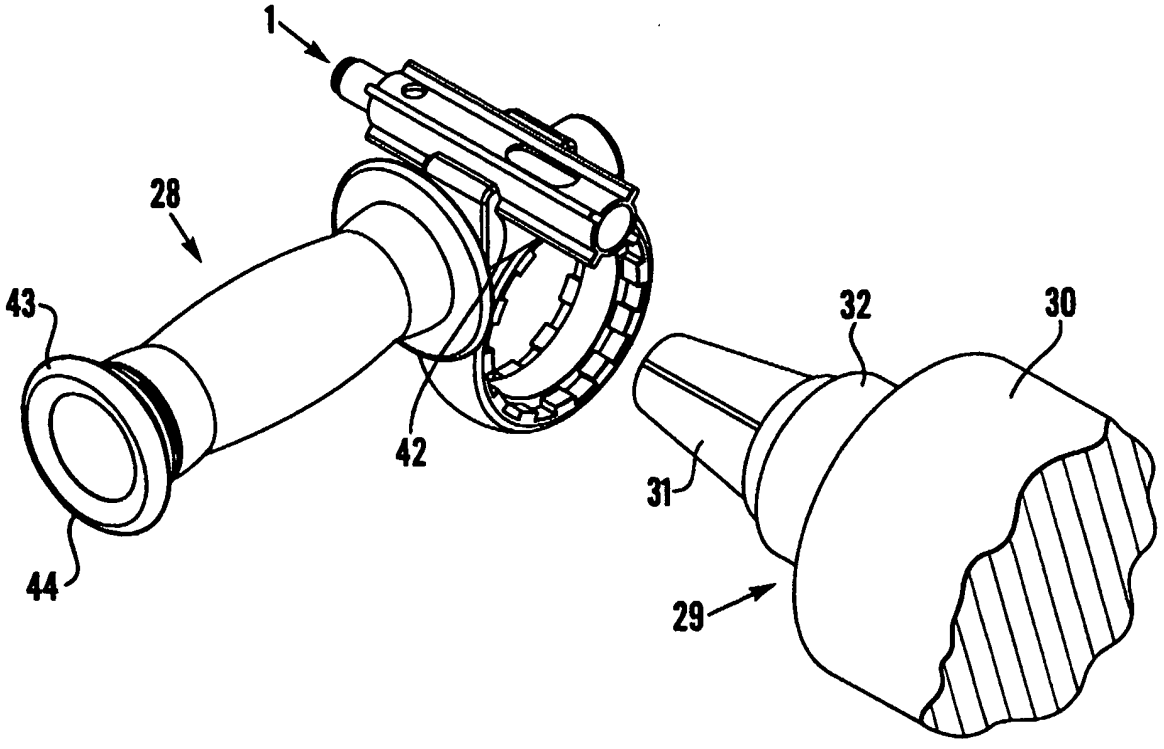

Fig.4

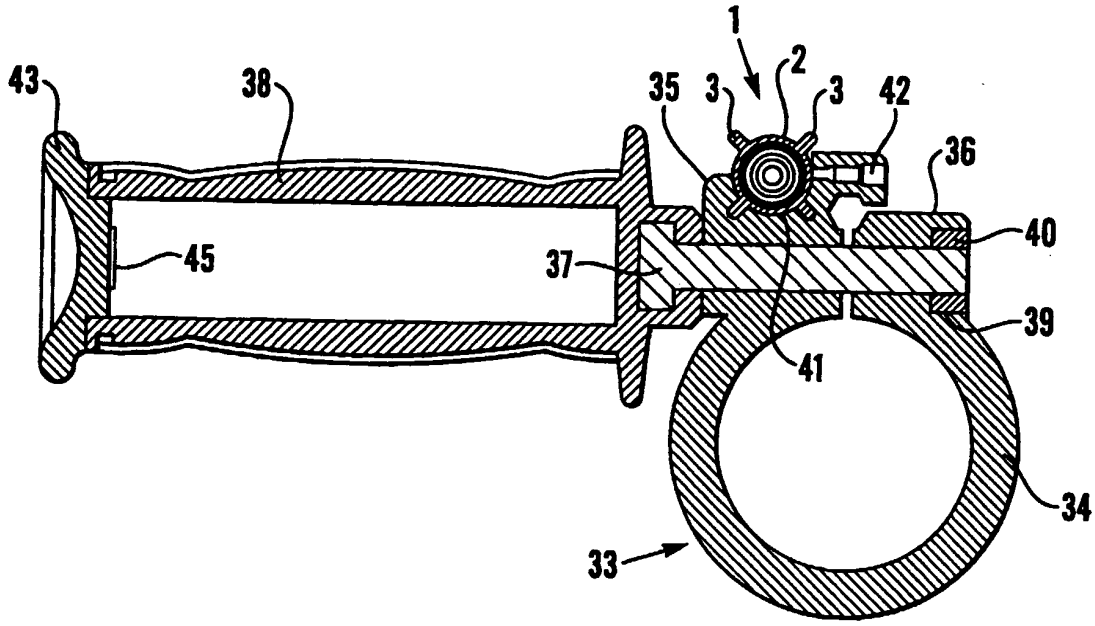

Fig.5

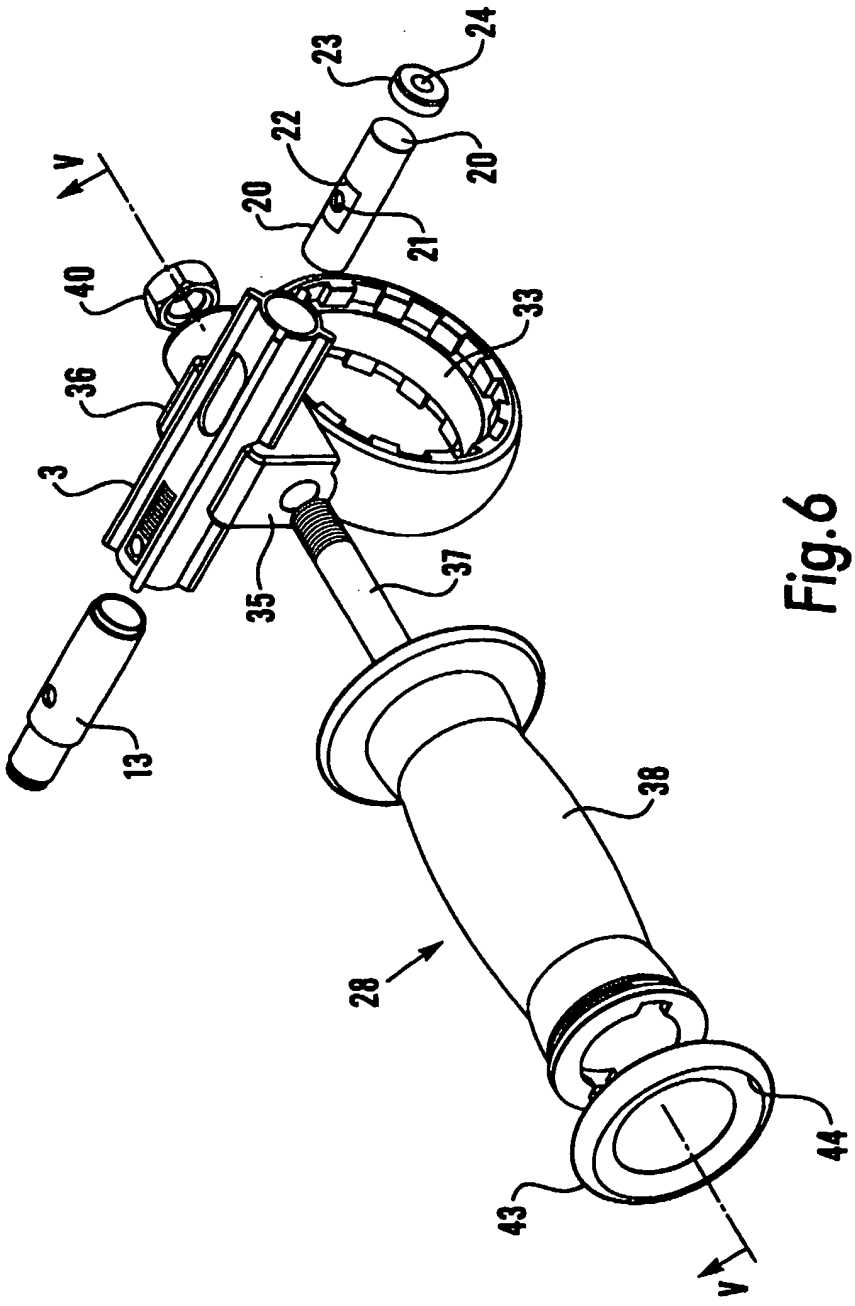

Fig.6

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MULTIFUNCTION DIRECTION INDICATION DEVICE

This invention relates to a device for facilitating the levelling and or positioning of an article with respect to a desired direction.

It is of course well known to determine the levels of horizontal and vertical surfaces by the so-called spirit level, this being a device including a container filled with an appropriate liquid sufficiently to leave within the container an air bubble. In use indication of a horizontal or vertical level is effected by positioning the bubble with respect to reference or fiduciary marking provided upon the container.

It is also well known to establish verticals such as during the hanging of wall paper to use a weight suspended from a length of cord or the like.

It is well known in the handling of various hand holdable tools such as, for example, a hand held drill, that it is usually of importance that the drill is maintained accurately perpendicular to the surface into which a hole is being drilled.

In practice, if one is attempting to drill into a vertical wall a hole that is required to be perpendicular to the surface of the wall it is important that the longitudinal axis of the drill is maintained in a horizontal plane and at the same time perpendicular to the surface of the wall so as to ensure that the longitudinal axis of the hole produced is accurately aligned in the required direction fully perpendicular to said surface.

As will be appreciated, there are in existence a very large number of hand holdable tools requiring when in use to be correctly set with respect to a surface etc. with which the tool is required operationally to relate which do not

incorporate a readily available facility for providing indication of the positioning of the tool with respect to the horizontal and or vertical surfaces..

It is an object of the present invention to provide a direction indication device which is of a multifunction usage capability.

Broadly, according to a first aspect of the invention there is provided a device including at least three means for facilitating orientation of the device with respect to a desired direction relative to vertical direction and/or horizontal direction.

In a preferred construction of the device, the device is provided with a first means for indication of orientation of the device relative to a first direction, a second means for indication of orientation of the device relative to a direction transverse to the first direction, and a third means for providing indication of the orientation of the device relative to any desired angle relative to the first and second directions.

Conveniently, the first and second means comprise spirit levels.

Preferably, said third means includes a source of laser light arranged to produce a beam of light.

According to a further aspect of the invention there is provided a mounting assembly for a device including at least three means for facilitating orientation of the device with respect to a desired direction relative to vertical and/or horizontal directions, said mounting assembly being adapted for mounting to a hand holdable tool.

Preferably, the mounting assembly includes means for enabling the mounting assembly to be removably attachable to the tool in such position that the indication means of the device serve to be able to define vertical and horizontal directions.

Preferably, In relation to hand holdable tools the mounting assembly is adapted to mount a means for enabling a user of the tool to offset undesired movements of the tool relative to a work piece during the use of the tool

Conveniently the mounting assembly includes a handle assembly holdable by the user of the tool during the use thereof for the purposes steadying the tool with respect to a workplace.

Preferably, the hand holdable assembly includes a housing adapted for the stowage of the device, wherein the housing incorporates a support element adapted so to support the device that the latter is able to indicate direction with respect to a vertical direction when supported by the support element.

Conveniently, the support element is formed by a closure cap or the like for the housing.

Preferably, the mounting assembly handle is adapted to form said housing.

Conveniently, the closure cap or the like incorporates means for enabling the devise to be suspended in the manner of a plumb bob.

For a better understanding of the invention and to show how to carry the same into effect reference will now be made to the accompanying drawings in which:-

Figure 1 is a plan view of apparatus incorporating the features of the invention and including a housing for accommodating multifunction position indicating

devices, the Figure illustrating such devices in their operational positions within the housing;

Figure 2 is a section on the line II-II of the apparatus of Figure 1;

Figure 3 is an end view of the apparatus of Figures 1 and 2 when the longitudinal axis thereof is vertical.

Figure 4 is a view of a steadying handle assembly for use with hand holdable tools involving rotatable tool carrying chucks or the like, a fragmentary portion of an electrical drill being shown;;

Figure 5 is a longitudinal sectional view on the line V-V of Figure 4; and

Figure 6 is an exploded view of the apparatus shown in Figure 4 less the d rill.

Referring now to Figures 1 to 3, the apparatus 1 shown therein includes a tubular housing 2 having a generally circular cross section. Four outwardly directed longitudinally directed webs 3 are equiangularly spaced around the outer periphery of the housing 2. Two axially directed elongate openings 4 are provided in the housing 3 towards a first end 5 thereof. The openings 4 are immediately opposite one to the other and each such opening has elongate side walls 6 and curved end walls 7.

A further elongate slot 7 is formed in the housing 2. This slot 7 is located towards the other end 8 of the housing 2 and is intended to serve as a mounting locating for the slide type switch unit 9 including a switch actuating means 10 that is operationally controlled by a slide element 11 longitudinally displaceable of the housing 2 and the slot 7. The switch actuating means is secured to the housing 2 by screws 12

The screws 12 are additionally utilised to retain a laser unit 13 in a predetermined position within the housing 2. It will be understood that other arrangements can be provided for this purpose. The construction of the laser unit 13 is not shown in full details since for the purposes of this Application it is believed sufficient to merely illustrate its general form. The unit 13 includes a cylindrical housing 14 that is a sliding fit within the housing 2. The interior of the housing 14 provides space for a laser light producing unit and batteries (schematically shown at 14A and 14B respectively). When installed in the housing 2 the light emitting end 15 of the laser unit 13 projects in prolongation of the housing 2. The laser unit 13 produces a narrow rectilinear beam of light indicated by the numeral 17 in conventional manner. The direction of the beam of light 17 is coaxial with that of the laser unit 13 and thus the longitudinal axis 16 of the housing 2.

The laser unit 13 incorporates an on/off switch in the form of a resiliently loaded button/ball element 19. When the unit 13 is correctly positioned within the housing 2 the slide switch actuating means 10 is able operationally to co-operate with the element 19.

An elongate horizontal level indicating vial 20 is located within the housing end 5. The vial contains a liquid of such quantity as to leave a bubble 21 of air within the vial to form what is commonly known as a spirit level for enabling indication of the accuracy of horizontal positioning of the housing 2 and thus the laser beam 17. The longitudinal axis of the vial 20 is coaxial with the longitudinal axis 16 of the housing 2 and thus the laser beam 17. The vial 20 is located in such position that the vial aligns with the apertures 4 whereby the bubble 21 of the vial can be seen through the apertures 4.

The vial 20 is provided with two spaced apart fiduciary lines 22 that are marked upon the vial container at such separation in relation to the volume of the bubble 21 that when the axis of the vial and thus that of the housing is correctly

horizontal the axial length of the bubble just fits within the separation between the fiduciary lines 22.

A circular vial 23 forming a further spirit level for indicating accuracy of the verticality of the longitudinal axis of the housing 2 and this the direction of the laser beam 17 is also located at the end 5 of the housing 2 such that the air bubble 24 thereof may be seen from the end 5 of the main body 2. This vial 23 incorporates an annular fiduciary line 25 of such diameter that when the housing 2 is accurately vertical the bubble 24 is centred within the fiduciary line 25. The vial 23 can be held in place by any convenient means. For example, such as an annular locking ring screwing into the housing end 5. Figure 3 very schematically illustrates apparatus when arranged in a vertical setting with the end 5 uppermost..

In order to provide the apparatus of the invention with a further facility of use a member 27 (that can be a hook or a ring providing arrangement as shown) is located at the end 5 of the housing 2 whereby the apparatus of the invention is readily suspendible vertically in such manner that the laser light unit 13 hangs vertically downwards whereby its light beam 17 can be directed vertically downwards in situations wherein it is desired to be able to mark or otherwise indicate a vertical downward direction

Since it is intended that the apparatus of the should be used in conjunction with a hand holdable tool such as an electric drill or similar use is made of the steadying handle/support as is conventionally used with such tools.

Referring now to Figure 4 which illustrates the apparatus 1 of the invention when mounted to a steadying handle 28 (to be discussed hereinafter) that is shown in exploded view arrangement with a fragmentary portion of an electric drill 29.

As is well known a hand holdable tool such as an electric drill includes a main body construction 30 incorporating a chuck 31 for for receiving drills to be used with the drill.

At the end of the drill main body main body adjacent to the chuck 31 there is conventionally provided a circumscribing collar 32 which is intended to mount the steadying/support handle assembly 28 that is intended to provide a user of the hand holdable tool with additional control in addition to that affordable by the hand actually holding and controlling tool operation. In practice the handle assemblies 28 are designed to enable left and right hand mounting to the collar 32 to accommodate left and right handed users.

A construction of such a steadying handle/support handle assembly 28 that is additionally intended operationally to mount the apparatus 1 as illustrated in Figures 1 to 3 is illustrated in cross section in Figure 4 and in exploded view in Figure 6.

The steadying/support handle assembly 28 shown therein comprises a split ring member 33 mountable to the circumferential collar 32 of the drill 29 the member 33 effectively incorporates an annular C-shaped portion 34 with the ends thereof terminating at end pieces 35 and 36 The end pieces 35 and 36 are both suitably apertured to be able to engage with a bolt 37. One end of the bolt is integrally connected to a handle 38 and thus forms a captive bolt with the handle in such manner that rotation of the handle rotates the bolt 37. The end piece 36 that is remote from the handle as is particularly seen in the Figures 5 and 6 has a recess 39 in the form of a hexagonal/square for locating a nut 40 that is threadably engageable with the bolt 37. With this arrangement rotation of the handle 34 and thus the bolt 37 displaces the end pieces 35/36 towards or away from each other. When the ring member 33 is engaged with the drill collar 32 appropriate rotation to pull the end pieces 35/36 towards each other cramps the ring member

33 onto the collar 32 and this onto the drill 29. Handle rotation in the reverse direction such as to move the end pieces 35/36 apart releases the cramping action and allows removal of the steadying handle assembly 28 from the drill 29.

In practice, several sizes of ring-member inserts (not shown) could be provided to suit differing diameters of the drill collar dimensions. Conveniently, each such ring member will be dimensioned so as to be able to fit inside the next size up of ring member.

In accordance with a further aspect of the invention the steadying/support handle assembly 28 is adapted so as to be able operationally to mount the apparatus 1 of Figures 1 to 4,

As shown in Figures 5 and 6 the end piece 35 is provided with an appropriately shaped grove 41 aligning with the axis of the ring member 33. This grove 41 includes two elongate recesses 42 into which the webs 3 are smoothly longitudinally slidable as a firm push fit..

When the apparatus 1 is so mounted in the grove 41 the longitudinal axis 16 of the apparatus 1 is parallel to the longitudinal axis of the drill chuck 26 and thus any drill mounted therein.

The apparatus 1 is conveniently held in place be a resiliently loaded catch member 42 provided as indicated in the end piece 36. This catch member can be a spring loaded detent engageable with a complementary recess in the apparatus 1. Alternatively provision can be made for a locking screw.

The handle 38 is hollow and provides a storage chamber for the device 1 the latter being retained within the handle by an end cap 43 that can have a threaded part

engageable with a complimentary thread provided in the end of the handle 38 remote from the end that cooperates with the ring member 33.

This end cap 43 is additionally provided with a flat outer end face ring like edge region 44 and an internal surface 45 that is perpendicular to the plane of the end face edge and which is of such diameter that it can be engaged by the projecting end 15 of the laser unit 13 so that when the latter is engaged in the end cap surface 45 the longitudinal axis of the device 1 is perpendicular to the plane of the end face ring edge 44.

With this arrangement when the device 1 is engaged with the end cap 43 and the end face edge 44 thereof is placed upon a surface i.e., the top of a post (not shown) that is required to have a horizontal top surface the longitudinal axis 16 of the device 1 will be perpendicular the post top surface. Hence the spirit level 20 provided at the other end of the device will provide an indication as to whether or not the longitudinal axis 16 of the device is vertical and in consequence whether or not the surface upon which the end cap stands is horizontal.

Since the end cap of the housing 2 associated with the circular spirit level 20 of the device itself is provided with the means 27 whereby the device can be suspended in such manner that the device hangs vertically downwards the device can be used in the manner of a plumb bob.

In practice, the laser unit 13 can, when the device is so suspended, provide the facility of indicating downwardly vertical directions and/or positions on a wall or floor immediately below the source of the laser light beam 17 and thus immediately beneath and in vertical alignment with the longitudinal axis 16 of the device.

Furthermore, when the device is mounted by the closure cap 43 the facility is afforded of being able to mark vertical directions and/or positions on a wall or

floor immediately above the source of the laser light and thus immediately above and in vertical alignment with the longitudinal axis 16 of the device.

It will be appreciated that the device according to the invention can be housed in any convenient housing other than being stowed within a steadying/support handle for a hand holdable tool.

The provision of the combination of the spirit level 20 and the laser unit 13 in the device of the invention offers the facility of being able to align, for example, a hand holdable tool required to be used at a first location with respect to a distance reference position. In other words this combination makes it possible to determine horizontal levels in the absence of a horizontal support to a spirit level.

In a further arrangement the structure of the switching of the laser unit can be effected by a push pull action upon a rocker switch, or the employment of a rotational movement of the unit within main body 2 of the device.

In an alternative construction (not shown) of the vial 20 the latter can be effectively combined with the vial 23 in that two separate vials could be replaced by a single vial that can serve to indicated both horizontal levels and vertical levels by adapted he horizontal vial construction to have a suitably shaped end that can accommodate the bubble for vertical direction indication purposes when arranged with the vial axis vertical..

As a further mode of use of the apparatus/device the latter can be placed against a wall or the like and by using the vial 20 as a horizontal indication to define the horizontal the laser beam 17 can be used to indicate a visible horizontal line. Thereby defining a horizontal line for when fitting for example dado rails, boarder papers, shelves etc. Similarly when paper hanging the laser beam can be used to vertically align paper edges.

CLAIMS

1. A direction indicating device/apparatus including at least three means for facilitating orientation of the device with respect to a desired direction relative to vertical and/or horizontal directions.

2. A device/apparatus as claimed in claim 1, and wherein two of the means provided for indicating direction comprise spirit levels.

3. A direction indicating device/apparatus as claimed in claim 1 or 2, and wherein said means are separate one from the other.

4 A direction indicating device/apparatus as claimed in claim 1,2 or 3, and including a first means for indication of orientation of the device relative to a first direction, a second means for indication of orientation of the device relative to a direction transverse to the first direction, and third means for providing indication of the orientation of the device to any desired direction relative to the first and/or second directions.

5. A device/apparatus as claimed in claim 4, and wherein, the first and second means comprise spirit levels.

6. A device/apparatus as claimed in any one of the preceding claims 1 to 5, and wherein one of said direction indicating means includes a source of laser light arranged to produce a beam of light orthogonal to the directions of of the two other directions..

7. A direction indicating device/apparatus as claimed in any one of claims 1 to 6, wherein and including means for enabling the device to be suspended in the manner of a plumb bob.

8. A direction indicating device/apparatus including at least three means for facilitating orientation of the device with respect to a desired direction relative to vertical and/or horizontal directions substantially as herein before described with reference to Figures 1, 2 and 3 of the accompanying drawings.

9. A mounting assembly for operationally mounting a device/apparatus including at least three means for facilitating orientation of the device with respect to a desired direction relative to vertical and/or horizontal directions, to a hand holdable tool requiring to be operationally maintained with its associated tool aligned with one or more of said directions.

10. A mounting assembly as claimed in claim 9, and wherein the mounting assembly includes means for enabling the mounting assembly to be removably attachable to the tool in such position that the indication means of the device serve to be able selectively to define vertical and horizontal directions.

11, A mounting assembly as claimed in claim 9 or 10, and wherein to said direction indicating apparatus/device is operationally mountable to a user steadying handle arrangement attachable to the tool for enabling a user of the tool to offset undesired movements of the tool relative to a work piece during the use of the tool.

12 A mounting assembly as claimed claim 11 wherein the steadying handle arrangement is adapted to provide for the stowage of the apparatus/device when not required for use.

13. A mounting arrangement as claimed in claim 11, and wherein the handle of the handle arrangement is hollow and provides chamber for receiving the apparatus/device as claimed in anyone of claims 1 to 7.

14. A mounting arrangement as claimed in claim 13, and including a closure cap for the chamber that is adapted to mount the apparatus/device in such manner that the device is set to a one of said orientations.

15 A mounting arrangement as claimed in claim 14, and wherein, the closure cap or the like incorporates means for enabling the apparatus/device to be suspended in the manner of a plumb bob.

16. A mounting assembly for operationally mounting a device/apparatus including at least three means for facilitating orientation of the device with respect to a desired direction relative to vertical and/or horizontal directions, to a hand holdable tool requiring to be operationally maintained with its associated tool aligned with one or more of said directions substantially as thereinbefore described with reference to Figures 4,5 and 6 of the accompanying drawings..

Application No: GB 0309968.6
Claims searched: 1-8

Examiner: Michael Walker
Date of search: 17 September 2003

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
X,E	1-7	GB 2374930 A	(SMITH) whole document
X	1-5, 7	GB 2358926 A	(AVOS) whole document
X	1-7	JP 9021641 A	(SHINWA RULES) see abstract
X	1-5,7	US 200101049879	(MOORE) see abstract
A		GB 1511490	(STRAWSON)
A		US 6375395	(HEINTZEMAN)

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[V]:

B3C; G1F

Worldwide search of patent documents classified in the following areas of the IPC[7]:

B25H; B25F; G01C

The following online and other databases have been used in the preparation of this search report:

On-line: EPODOC, WPI, JAPIO